

STAC Independent Scientific Peer Review Panel Questions for the James River Chlorophyll *a* Criteria Re-evaluation May 20, 2016

CBP Groups: [Scientific and Technical Analysis and Reporting \(STAR\) Team's
Criteria Assessment Protocol \(CAP\) Workgroup;
Water Quality Goal Implementation Team \(WQGIT\)](#)

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Introduction

In 2005, the Virginia Department of Environmental Quality (DEQ) promulgated a set of tidal James River specific numerical chlorophyll *a* criteria, along with specific criteria attainment assessment procedures, into the Commonwealth's water quality standards regulations. In 2011, the Commonwealth of Virginia identified a need for additional scientific study to ensure that chlorophyll *a* criteria for the tidal James River were appropriately protective of aquatic life designated uses. The Virginia Department of Environmental Quality initiated a review of the numeric chlorophyll *a* criteria for the James and established a Science Advisory Panel to analyze the best scientific information currently available and provide recommendations as to whether the chlorophyll *a* criteria were protective of the aquatic life designated use and scientifically defensible.

Reports to be reviewed by the Panel

The Virginia Department of Environmental Quality's James River Chlorophyll *a* Criteria Re-evaluation Science Advisory Panel has produced a report entitled: "Empirical Relationships Linking Algal Blooms with Threats to Aquatic Life Designated Uses in the James River Estuary." The Panel report was based on an intensive 3-year research and monitoring program funded by Virginia Department of Environmental Quality as well as existing published scientific literature. This is the principal report to be peer reviewed. (44 pages)

A separate report entitled "Proposed Assessment Methodology for James River Chlorophyll Criteria", authored by Dr. Tish Robertson, Virginia Department of Environmental Quality, documents an **alternative chlorophyll *a* criteria assessment methodology to the existing chlorophyll *a* criteria assessment methodology published by EPA and adopted by Virginia into their state water quality standards regulations.** This is the second report to be peer reviewed. (22 pages)

Resource Materials for the Panel

The Panel members are encouraged to consult the following resource materials for further background

and insights into the process for drafting both the Empirical Relationships and Proposed Assessment Methodology reports described above.

- “From Programmatic Goals to Criteria for Phytoplankton Chlorophyll *a*”, written by Dr. Claire Buchanan, Interstate Commission of the Potomac River Basin, with funding provided by Clean Water Act §106 funds from U.S. EPA Region 3, recommends consideration of a reference-based approach to criteria derivation. (44 pages)
- “Critical Review of the Assessment Methodology for James River Chlorophyll Criteria”, written by Dr. Tish Robertson, Virginia Department of Environmental Quality, documents an evaluation of the existing chlorophyll *a* criteria assessment methodology published by EPA and adopted by Virginia into their state water quality standards regulations. (85 pages)

As part of the process for writing the Science Advisory Panel’s report, panel members were encouraged to provide their comments on the draft report. Those sets of comments are listed below.

- “Observation on the Use of Arithmetic vs. Geometric Mean Chlorophyll *a* Targets” written by Clifton Bell, March 16, 2016. (4 pages)
- “Comment on the arithmetic vs. geometric mean interpretation of James River Chl*a* criteria values” written by Claire Buchanan, Interstate Commission on the Potomac River Basin, April 15, 2016. (2 pages)
- “Comments on *Empirical Relationships Linking Algal Blooms with Threats to Aquatic Life Designated Uses in the James River Estuary* – version dated April 14, 2016” written by Clifton Bell, Brown and Caldwell, April 18, 2016. (34 pages)
- “Comments on *Empirical Relationships Linking Algal Blooms with Threats to Aquatic Life Designated Uses in the James River Estuary* (dated April 14, 2016)” written by Will Hunley, Hampton Roads Sanitation District, April 19, 2016. (28 pages)
- “Edits to *Empirical Relationships Linking Algal Blooms with Threats to Aquatic Life Designated Uses in the James River Estuary* – version dated April 14, 2016” Peter Tango, U.S. Geological Survey/Chesapeake Bay Program Office, April 2016. (49 pages)
- “Comments on the 3/31 draft of the James River Science Advisory Panel Chlorophyll *a* report” written by Peter Tango, U.S. Geological Survey/Chesapeake Bay Program Office, April 26, 2016. (2 pages)
- James River Chlorophyll SAP Survey – Peter Tango, U.S. Geological Survey/Chesapeake Bay Program Office, undated. (5 pages)

Reference Documents for the Panel

The Panel members are encouraged to consult the following reference documents for further background on and documentation of the prior and more recent efforts to derive numerical chlorophyll

a criteria for Chesapeake Bay.

- U.S. Environmental Protection Agency. 2003. *Ambient Water Quality Criteria for Dissolved Oxygen, Water Clarity and Chlorophyll *a* for the Chesapeake Bay and Its Tidal Tributaries*. EPA 903-R-03-002. U.S. Environmental Protection Agency, Region 3, Chesapeake Bay Program Office, Annapolis, MD. Reviewers should focus on Chapter 5 *Chlorophyll *a* Criteria* starting on page 101 and Chapter 6 *Recommended Implementation Procedures* starting on page 145.
- U.S. Environmental Protection Agency. 2007. *Ambient Water Quality Criteria for Dissolved Oxygen, Water Clarity and Chlorophyll *a* for the Chesapeake Bay and Its Tidal Tributaries. 2007 Chlorophyll Criteria Addendum*. EPA 903-R-07-005 CBP/TRS 288/07. U.S. Environmental Protection Agency, Region 3 Chesapeake Bay Program Office, Annapolis, MD.
- U.S. Environmental Protection Agency. 2008. *Ambient Water Quality Criteria for Dissolved Oxygen, Water Clarity and Chlorophyll *a* for the Chesapeake Bay and Its Tidal Tributaries: 2008 Technical Support for Criteria Assessment Protocols Addendum*. EPA 903-R-08-001. CBP/TRS 290-08. U.S. Environmental Protection Agency, Region 3 Chesapeake Bay Program Office, Annapolis, MD. Reviewers should focus on Chapter 5 *Chlorophyll *a* Criteria Assessment Procedures* starting on page 27.
- U.S. Environmental Protection Agency. 2010. *Ambient Water Quality Criteria for Dissolved Oxygen, Water Clarity and Chlorophyll *a* for the Chesapeake Bay and Its Tidal Tributaries: 2010 Technical Support for Criteria Assessment Protocols Addendum*. May 2010. EPA 903-R-10-002. CBP/TRS 301-10. U.S. Environmental Protection Agency, Region 3 Chesapeake Bay Program Office, Annapolis, MD. Reviewers should focus on Chapter 4 *Revisions to the Chlorophyll *a* Criteria Assessment Methodology* starting on page 31.
- L. W. Harding Jr., R. A. Batiuk, T. R. Fisher, C. L. Gallegos, T. C. Malone, W. D. Miller, M. R. Mulholland, H. W. Paerl, E. S. Perry and P. Tango. Scientific Bases for Numerical Chlorophyll Criteria in Chesapeake Bay. *Estuaries and Coasts*. DOI 10.1007/s12237-013-9656-6.

Electronic copies of all the above listed documents are being provided to each Panel member for their use and reference.

Expertise needed for the review team

Chesapeake Bay chlorophyll *a* criteria derivations, attainment assessments, and management applications involve the array of understandings of phytoplankton dynamics, estuarine food web dynamics, and statistical analysis and interpretation of spatially complex data. An effective review team will have members familiar with:

1. The dynamics of estuarine phytoplankton and food web dynamics and responses to changes in water quality conditions characteristic of Chesapeake Bay
2. Spatial statistics
3. Application of water quality criteria in a TMDL context.

2016 James River Chlorophyll *a* Criteria Re-evaluation Review Questions:

The Chesapeake Bay Program (CBP) partnership requests a scientific review that directly addresses the following questions. The review committee may also make recommendations for future work by the CBP partnership that build on the questions or are related to the scientific or management issues raised in the review. The review committee will be provided with the relevant documentation and will be given access to CBP partners to facilitate the review. The review committee will generate a written report addressing the questions for submittal to the U.S. EPA Chesapeake Bay Program Office and the Virginia DEQ. STAC independent scientific peer review comments will be considered by Virginia DEQ during the pending state rulemaking to amend the James River numeric chlorophyll *a* criteria and assessment methodology; as such, a specific response to STAC comments will not be made by Virginia DEQ. EPA will ensure the STAC peer review record includes responses to the peer review panel's comments.

1. Do we accept the scientific bases for applying a combined probability approach to derive expected frequencies of threshold exceedance as a function of mean chlorophyll *a* to determine whether attainment of these criteria would result in low rates of threshold exceedance?
2. Do we accept the approach's focus on the harmful effects of algae to derive chlorophyll criteria, rather than using reference conditions (as described in Buchanan, 2016) as an additional line of evidence?
3. Do we accept the approach for defining categories of threshold exceedances as 'protective', 'defensible', and 'not protective' and then applying them to make the determination as to whether the existing Virginia chlorophyll *a* criteria are protective of the aquatic life designated use and scientifically defensible?
4. Do we accept the finding that "the results of the effects-based analysis suggest that the arithmetic mean is the better statistic for assessing protectiveness of chlorophyll *a* criteria owing to its greater sensitivity to infrequent, high chlorophyll *a* conditions associated with deleterious water quality conditions" when the Virginia chlorophyll *a* criteria are stated and applied as geometric means in deriving attainment of water quality standards?
5. Do we accept the finding that "the current criteria were found in all cases to be defensible in that they fell below the non-protective range...therefore, the results of the effects-based analysis do not provide compelling evidence of the need to lower the existing criteria"?
6. Do we accept the scientific basis for replacing the current chlorophyll *a* criteria attainment assessment procedures with the proposed alternative current chlorophyll *a* criteria attainment assessment procedures?
7. Do we accept that scientific basis and procedures described within the Scientific Advisory Panel's draft report could be used to derive new chlorophyll *a* criteria for application to other tidal habitats within Chesapeake Bay with the same salinity regimes and provide similar levels of protection of aquatic life?